

5.2

Hooke's Law and Periodic Motion

The diver approaches the end of the board, bounces a couple of times, then arcs out into the air in a graceful dive. The diving board plays an important role in his action. The diver uses chemical energy to jump, gaining kinetic energy. His kinetic energy transforms into gravitational potential energy and then back into kinetic energy. When he returns to the board, slows, and stops, his kinetic energy does not transform into gravitational potential energy. In what form is the energy stored?



Figure 5.7 A diving board transforms a form of potential energy into kinetic energy of the diver.

Describing Elastic Potential Energy

The diving board in Figure 5.7 is behaving much like a spring. When the diver lands on the board after jumping, the diving board exerts a force on him, doing work on him that reduces his kinetic energy to zero. At the same time, the diver is exerting a force on the diving board, doing work on the board and causing it to bend. In its bent condition, the diving board is storing energy called **elastic potential energy**. Because the diving board is elastic, it returns to its original form, and in doing so, it transfers its elastic potential energy back into kinetic energy.

Springs are commonly used, much like the diving board, to absorb energy, store it as elastic potential energy, then release it in the form of kinetic energy. A bicycle seat has a spring that reduces the jarring effects on the rider of bumps in the road. Springs in a mattress provide a flexible support that allows the surface to match the contours of the sleeper. Pressure is applied evenly over the lower surface of the sleeper, rather than being concentrated at a few points.

In this section, you will examine elastic potential energy in the form of stretched and compressed springs.

SECTION EXPECTATIONS

- Analyze and explain common situations using the work-energy theorem.
- State Hooke's law and analyze it in quantitative terms.
- Define and describe the concepts and units related to elastic potential energy.
- Apply Hooke's law and the conservation of energy to periodic motion.

KEY TERMS

- elastic potential energy
- Hooke's law
- spring constant
- restoring force
- periodic motion



Figure 5.8 In what ways do these springs behave the same?